

3-2002

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Adams, Geoffrey and King, Karen, "Introduction to Three Dimensional Composition / Dancing on the Digital Divide" (2002).
Proceedings of the 18th National Conference on the Beginning Design Student. Paper 1.
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Introduction to Three Dimensional Composition / Dancing on the Digital Divide

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Students entering the 3.5Y Masters program at UNM, come to embark on a course of study in architectural design. While all student populations are composed of unique individuals from various backgrounds, this particular group is, at least in an academic discipline by definition heterogeneous, possessing skills and knowledge in diverse fields gained through previous studies and/or employment. What they share is a burgeoning interest in architecture and a willingness to explore design in a studio environment, to start down a path toward a new way of perceiving and engaging the world. This peculiar mix of naivety and sophistication coupled with the insecurities of setting out on a radically new tact makes special demands on a beginning design problem. Embarking on this odyssey at the turn of the 21st century necessitates confronting the complexity of nascent digital technology, a tool that offers much both in terms of promise and frustration to the beginning design student. This paper sets out to explore one endeavor to address these issues developed and refined over the past three years. In the process of delineating the introductory problem given to the 3.5Y Masters students some guiding principles employed in constructing the problem have come to light. The salient value of this recapitulation seems as much in recognizing principles governing the construction of the design problem as in the specifics of any particular instance.

The following is a distillation of some key principles that have informed (both consciously and subconsciously) the development of this problem. First, create a problem that you would love to do; a potent design problem should engage designers regardless of their level of experience or knowledge of practice. Enthusiasm is an essential raw material in the construction and application of a compelling design problem. Second; set limits, limits provide the structure, order and form of a design problem. Well-placed limits lay the groundwork for the exploration of a set of design principles and establish landmarks by which to navigate a process. Third, divide the problem into discrete pieces of limited duration, while providing continuity by linking these parts as segments subsumed by a larger whole. Fourth, intertwine and overlap media and content. For example, will a student discover something different when shaping form in a physical model as opposed to a digital model? Finally, provide the student with an opportunity to collaborate in an aspect of the design of the problem; the student's investment is essential. These principles are content independent. In other words, they do not specify a bias regarding which ideas, concepts or techniques should be investigated nor the order in which that investigation might

occur. They do, however, suggest a position with regards to process. A design methodology can be developed through a series of discrete, incremental, iterative design problems linked to a larger whole. This hierarchy endows the problem with a number of desirable qualities. First, by subdividing a larger problem into segments, the beginning student is less likely to become overwhelmed or incapacitated. Simultaneously by repeatedly executing a more or less "complete" cycle of a design process the student builds competence and confidence. Finally the design problem takes on a dual nature, at once broken and continuous, which supports investigations in diverse media and allows the student to develop a visceral understanding of the relationship between medium and design, to begin to dance across the digital divide.

This particular journey starts by giving students three distinct material volumes of different dimensions and asking them to construct a series of three orthogonal compositions each constrained by a cubic volume of 3"x 3"x 3". The material volumes may intersect one another or be coplanar, but must stand as a single unit on a flat surface maintaining an orthogonal relationship with it. Supplemental readings provide an anchor and a vocabulary for discussion about compositional deployment. The problem is to seek a visual balance (not necessarily a physical balance) between the elements, exploring the limits of stasis and dynamism. This is an empirical process involving trial and error. What may seem facile or simple at first offers rich spatial opportunities as nuances of arrangement and placement unfold. As they work students are encouraged to sketch and draw (draft) as a way of exploring 2D relationships of their 3D compositions. To complete the exercise students place but do not permanently attach the compositions on a 4" x 12" base, composing the placement of the three compositions in relation to each other and the field given, while being mindful of sequence. The expectation is that the final three compositions be well-crafted, dimensionally accurate gems because the most elegant and sophisticated design work will be made moot if its physical manifestation is shoddy. This assignment is given on the first day of studio and reviewed in a group session on the third studio meeting. The three elements differ in dimension and material. Embedded in the dimensions of the elements are "hidden" references to proportion both profound and quirky, the golden section (1x 1.618) in the former and the monolith from 2001 (the square of the first three integers) in the latter. This provides a diversionary mystery, which unfolds in parallel to the main task and sets the stage for the next problem, delineation and graphic

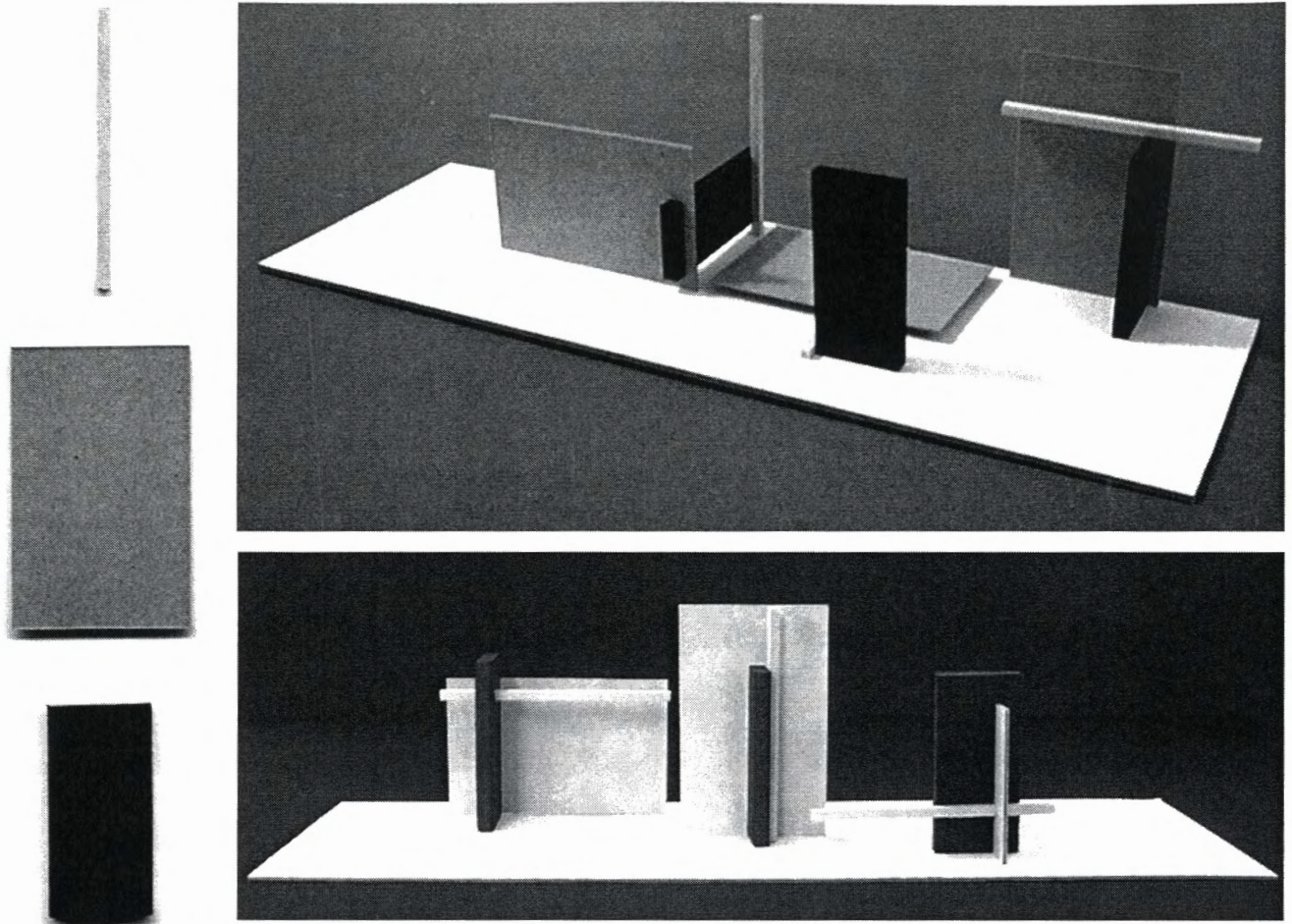


Fig. 1. three material volumes, two compositions

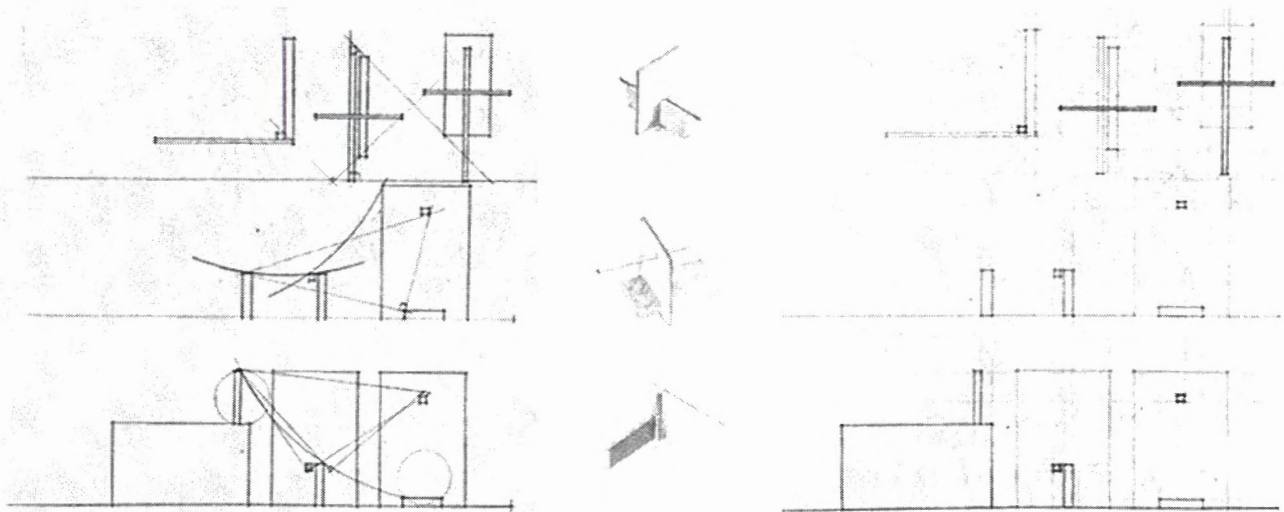
analysis of the completed compositions.

Using analog tools of pencil, trace paper, parallel rule and triangles students draft a top view (roof plan), side view (elevation) and section of the completed composition. Issues of spatial delineation by line weight and the craft of drafting are introduced along with the basic concepts of orthographic constructions. Guided by readings on regulating lines and the

golden section students graphically analyze their drawings in search of geometric relationships that may lie latent in their compositions. Geometric compositional relationships seem to spontaneously appear in their work putting the student in possession of these relationships and removing them from the realm of the arcane.

Concurrent with the graphic analysis, students step across the digital divide for the first time (at least in the context of this studio). Following a crash course in the rudiments of 3D modeling with a substantially reduced tool pallet using the

Fig. 2. graphic analysis



Form•Z software application, the drafted plans of their compositions become the template to recreate the original composition in the virtual digital environment. This exercise builds competence in deploying the software to build simple rectilinear shapes, challenging the students to concentrate on precisely recreating the composition dimensionally, thus gaining a sense of control and purpose in this virtual world. Using the digital reconstruction of each of the three previous compositions as a base condition they are asked to create a sequence of two more compositions by employing any of the following transformational techniques: translation, rotation (90 degree increments only), scaling and duplicating. These transformations add to complexity of the compositional problem by an order of magnitude, by using the organizational capabilities afforded by layers the student can easily examine and play with multiple design scenarios. At the end of the second week the second "virtual" presentation ensues. Using the powerful technology afforded by the OpenGL rendering algorithm and digital screen projection the entire class can participate in real time animated critique of the collection of schemes. This presentation technique immerses the viewers in virtual world allowing the group to simultaneously experience an intimate relationship with a particular project and contributing to lively discussion and unique critical opportunities.

The composition and crafting of two orthographic collages takes a step back from the virtual immersion of the previous exercise. Using the nine pieces created in the transformation exercise each student explores a set of linear collages (correlated plan and elevation) observing the following rules: a 5"x37" field is divided into 5" squares each overlapping the other by 1"; paper cut of appropriate size and color material to render the plan and elevation of each piece is then placed in spatial correlation in both plan and elevation collages; each piece must remain completely within one of the 5" squares (intersection of two pieces is possible in the 1" overlap). The students are to explore and develop an overall composition exhibiting balance and harmony. While offering another opportunity to explore compositional strategies and further develop craft skills, the project deliberately slows the process

Fig. 3. nine square composition

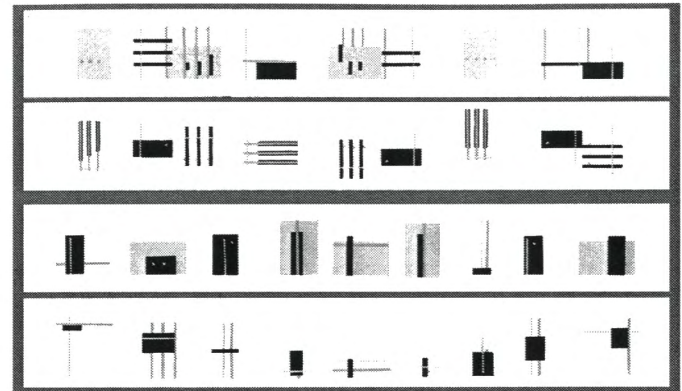
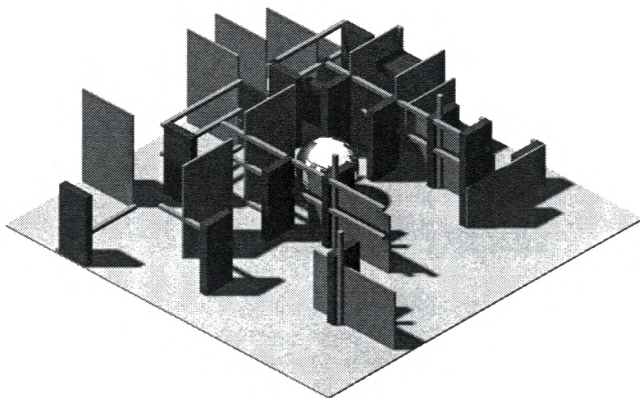


Fig. 4. collage exercise

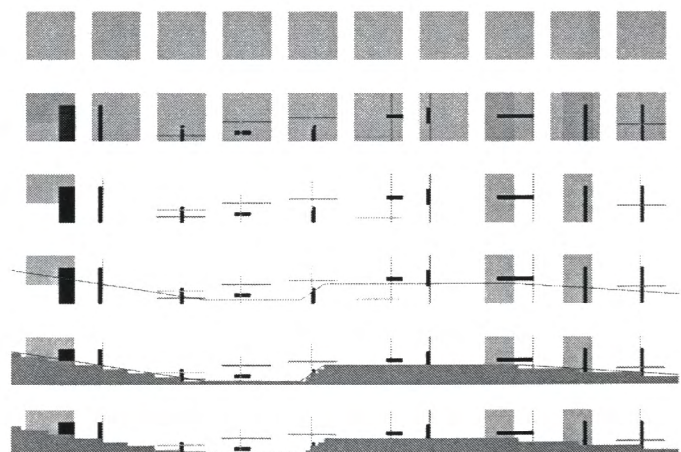
of constructing the plan and elevation, offering students the time necessary to contemplate and gain a conceptual command of these essential drawing conventions. While not dictated, many students chose to use the computer to develop the linear compositions and print out the finished plan and elevation as a template. This strategy afforded advantages of speed and spatial manipulation in compositional study, but the rote manufacture of the printed map somewhat subverted the intent of the exercise.

Jumping back into the digital universe students take their linear collage as a given condition and create a site topography by using no more than five line segments to describe a ground plane. The line must be continuous from one short side (of the elevation) to the other and may not extend above or below the 5" height of the field. Due to soil conditions no slope of greater than 45 degrees can exist. The pieces may be partially or completely subsumed, but must find anchorage in the site. Based on the 5 line abstracted topography they then build a stepped topographic model of the site using Form•Z embedding or placing the nine compositions into this newly generated landscape.

The culmination of the previous exercises forms an existing site condition for the following architectural design problem:

Meet pogo and sphere, they are ambassadors of adjacent civilizations that have recently become aware of each other's

Fig. 5. introduction of topography



existence. The site (the one you have made) is believed by both to be an ancient artifact dating back to a mutual parent civilization. They are seeking proposals for a shared environment to be developed on this site to better understand one another. Little is known about either except their sizes and respective modes of locomotion.

pogo: cylindrical in shape with a diameter of $1/8''$ and a height of $1''$. She moves by jumping like a pogo stick. Maximum vertical jump is $1/2$ her height. Maximum horizontal jump is her height. If jumping vertically and horizontally at the same time each maximum is reduced by half. Her path must be marked by square landing pads $1/4''$ on a side.

sphere: shaped as named, sphere is $3/4''$ in diameter. He moves by rolling. Any slope greater than $1/10$ is not negotiable by him.

Program:

A place for pogo.

A place for sphere.

A place to help pogo to understand the essence of sphere.

A place to help sphere to understand the essence of pogo.

Materials: You may quarry and reconfigure materials found on your site, but all materials must be conserved.

Motility forms the basis for understanding the inhabitants' relationship to the site and each other. Narrative is employed to further engage students in the problem. Through the creation of programmatic constraints and identification of programmatic opportunities, written in the form of a hypothetical interview with the inhabitants, a basis for decision making is generated. The narratives are almost always interesting and can be quite humorous, but their value as a pedagogical tool is that they provide a rich source of both conceptual and programmatic material with which students can infuse their projects. The narrative forms a fulcrum about which they can begin to develop a critical position.

The remaining portion of the assignment takes on a structure more typical of an architectural design problem. In the process of designing this project students must confront many

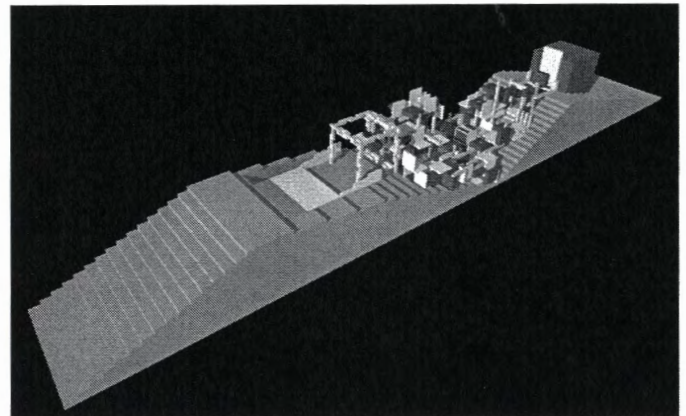
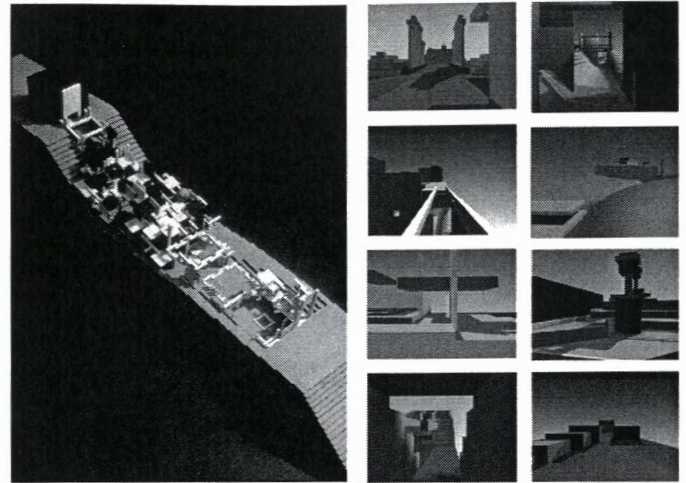
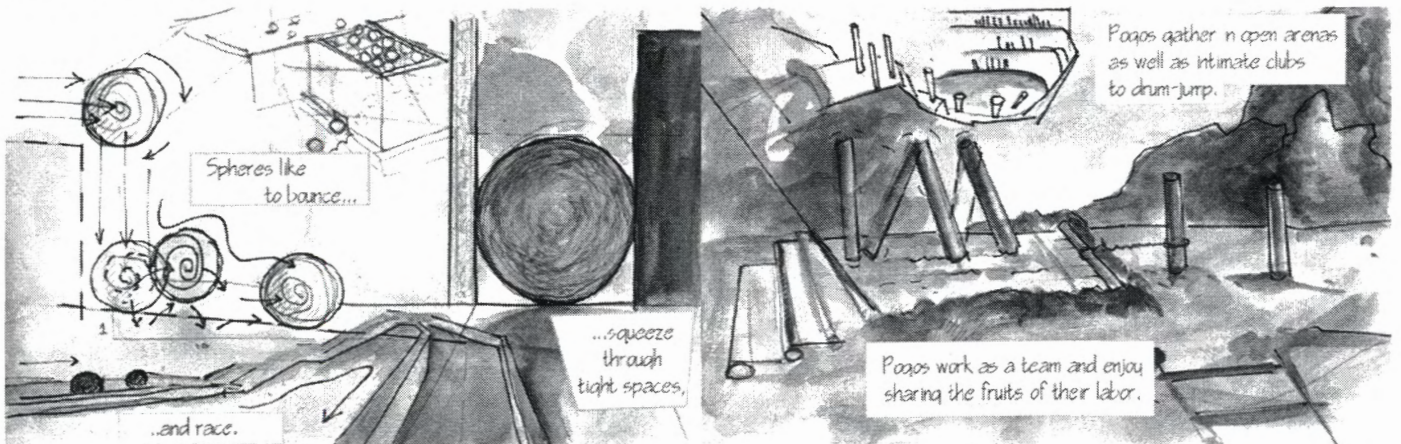


Fig. 7. final models, physical and virtual

of the key considerations of any architectural proposition, site, client/user, structure, economy and respond creatively through the manipulation of form, material and space. The relationship between design process and medium (digital/analog) continues to receive further exploration and evaluation by requirement. Each student must present a model of their final solution in both physical and virtual media. To truly begin to understand the relationship between these two profoundly different ways of exploring and experiencing space and apply this knowledge to design requires the visceral participation of each student. With advances in technology the line between

Fig. 6. narrative diagrams



what is digital and what is analog will undoubtedly become blurred and may even disappear. Gaps in the digital divide are already starting to fill in, but at this moment it is critical that beginning design students have a foot in both worlds and an intimate understanding of how they complement and contradict one another.